Velocity Management

and the Revolution in Military Logistics

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PREFACE

This publication reprints an article that appeared in a special issue of *Army Logistician* that was devoted to the Revolution in Military Logistics (RML). The notion of an RML is of interest in the Army logistics community because of a widespread perception that innovative operational concepts simply presume that the Army will possess a future logistics system that performs substantially "faster, better, and cheaper" than the current one. Many have questioned whether such revolutionary improvements in the logistics system are feasible or affordable.

The purpose of this article is so argue that many of the desired characteristics of an RML can be achieved affordably in the near term through the improvement of current processes. The argument is supported by evidence from the Army's Velocity Management (VM) initiative, which since its inception in 1995 has succeeded in achieving dramatic improvements both in the performance of key logistics processes and in the logistic community's capability to implement and institutionalize significant reforms.

Preparation of the article was supported by the Arroyo Center project "A Blueprint for the Future Army Logistics System." The "Blueprint" project is sponsored by the Deputy Chief of Staff for Logistics (DCSLOG); its action officer is at the Logistics Integration Agency (LIA), which is charged with developing the vision of the Army's RML as well as the Army's Strategic Logistics Plan" (ASLP). Questions regarding the Blueprint project should be directed to the project co-leaders, Rick Eden and John Folkeson. The project is managed in the Military Logistics Program, directed by John Dumond.

Related RAND publications on the topic of Velocity Management include the following:

- John Dumond, Rick Eden, and John Folkeson. *Velocity Management: An Approach for Improving the Responsiveness and Efficiency of Army Logistics Processes.* DB-126-1-A. 1995.
- R. D. Fricker, Jr., and M. Robbins. *Retooling for the Logistics Revolution: Designing Marine Corps Inventories to Support the Warfighter.* MR-1096-USMC. 2000.

- Kenneth J. Girardini, William Lewis, Rick Eden, and Earl S. Gardner. *Establishing a Baseline and Reporting Performance for the Order and Ship Process.* DB-173-A. 1996.
- Marc L. Robbins, Patricia M. Boren, Rick Eden, and Daniel A. Relles. *Measurement of USMC Logistics Processes: Creating a Baseline to Support Precision Logistics Implementation.* DB-235-USMC. 1998.
- *Speeding the Flow: How the Army Cut Order-and-Ship Time.* RB-3006. 1998.
- Mark Y. D. Wang, *Accelerated Logistics: Streamlining the Army's Supply Chain* With a Foreword by James A. Champy. MR-1140-A. 2000.

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Velocity Management and the Revolution in Military Logistics

by Thomas J. Edwards and Dr. Rick Eden

By now every logistician in the Army should recognize the famous sound bite from the Chief of Staff: "There will not be a revolution in military affairs unless there is a revolution in military logistics." When General Reimer identified the Revolution in Military Logistics (RML) as a necessary precondition of the revolution in military affairs (RMA), he seemed to issue a clear challenge to the Army logistics community.

Yet recent studies of the RMA commonly express little hope for delivering an RML, at least in the near term. For instance, in the article, "Strategic Logistics for Intervention Forces" (*Parameters,* Winter 1997-98), Lieutenant Colonel Yves J. Fontaine counters the Chief with another precondition: "The revolution [in military logistics] will occur only after our research community provides us with combat equipment that minimizes the logistical tail needed to sustain it." Similarly, in an article titled "An Appraisal of 'The Brigade-Based New Army'" (*Parameters*, Autumn 1997), Colonel David Fastabend expresses discouragement about achieving an RML. He describes the prospects of supporting the fast operations that characterize most concepts of the RMA: "The major barrier to the concept of flexible, independent maneuver on the battlefield remains logistics. There are no really good solutions for re-supplying these fast-moving organizations without some kind of logistical tail that, inevitably, restricts the speed and scope of the maneuver."

The need for an RML seems to present a classic case of an irresistible force (innovative military operations) meeting an immovable object (the Army logistics system). Something has to give. Either it is possible to achieve an RMA without an RML, or there is a way to achieve an RML without waiting for the Army to field a new suite of major weapon systems. This article supports the latter. The Army can deliver much of the RML quickly and affordably by focusing on the dramatic and continuous improvement of today's key logistics processes. Moreover, such an improvement effort has been underway for several years and has demonstrated remarkable success. It is called the Velocity Management (VM) initiative.

Two Keys to Achieving an RML

The basic point made by Fontaine and Fastabend is incontrovertible: When the Army fields future weapon systems, new technologies will permit design options that reduce the demand for logistics products (particularly consumables such as fuel) and services (particularly maintenance). Of course, logisticians should keep in mind that operators may decide *not* to reduce their demands for logistics services despite more efficient and lethal systems. Instead, they may choose to employ the less demanding weapon systems in much more demanding operational concepts. For example, if the future weapon systems consume half the fuel of today's analogous systems, then future operators may decide to double the amount of territory covered in a day.

But it is a mistake to equate the RML with reduced demand streams alone. Reduced demands for logistics support may contribute to the RML and may facilitate it, but they do not constitute it. Contrary to what many have claimed, it may be possible to deliver much of the RML before the Army fields a new suite of ultrasupportable weapon systems. Moreover, because most operational units will retain the older, "legacy" systems through the Army After Next (AAN) timeframe, most of the Army will need more than an RML that works only when supporting new systems.

A careful reading of the *Army Strategic Planning Guidance* identifies five components of the RML—

- ***Reduced demand streams from more supportable weapon systems.*** "New technologies must produce systems that require fewer supplies and consumables."
- ***More accurate and timely visibility of demands.*** Exploitation of real-time information connectivity, via health and status sensor platforms."
- ***Quicker, more responsive processes***. "Timely, integrated, and predictive support will be more capably executed."

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- ***Increased support from afar.*** "Installation capabilities must be leveraged to sustain the force during split-based operations over extended distances."
- ***Reduced footprint.*** "Deployment of fewer logistics support forces into theater."

As the Army considers what might constitute an RML and how it might be achieved, working with a broader definition affords more chances for success.

Moreover, there are important synergies and dependencies among the multiple components of the RML. For instance, achieving the third component in the list, "quicker, more responsive processes, " would contribute to the fifth component, "reduced footprint." In the past, when resupply was slow and unreliable, the more days of supply one held in a theater, the better; in the future, if resupply is very quick and dependable, the goal may become to minimize days of supply on hand. Other of the components listed also would contribute to reduced footprint.

Such relationships among components have important implications for implementing the RML, because they indicate the critical leverage points. Upon examining these relationships, one finds that there are two major keys to achieving the desired RML characteristics. The first is the approach identified by Fontaine and Fastabend: fielding more supportable weapon systems. This represents an expensive and long-term approach to achieving an RML.

Fortunately, another available approach requires little or no investment, though investment in appropriate enablers can facilitate it. This is the path of process improvement. Ultimately, these two approaches are complementary, but process improvement should take precedence for several reasons.

First, process improvement is affordable even in periods of declining resources. In cases where existing processes are highly ineffective or inefficient, initial reform efforts can achieve impressive results by "cherry-picking" using existing resources. Moreover, as the targeted processes become more productive, some resources are freed up. Some of these freed resources can be given up or redirected to other processes, while others can be used to fund additional reforms, such as a new information system, requiring an infusion of new resources.

A second, often unrecognized, benefit of process improvement is reduced demand for a service or product. A poorly performing process artificially magnifies or exaggerates demand. For instance, when the order and ship process is slow and unreliable, customers place duplicate orders. Similarly, when the diagnostic process is faulty, technicians remove, inspect, and even "repair" perfectly good parts.

Third, by clarifying the true demand for support, improvement of today's logistics processes may keep the Army from investing too much in improved supportability for tomorrow's weapon systems. Suppose, for example, that developers of concepts for AAN systems establish demand-reduction goals such as 40 percent fewer repair parts in the evacuation pipeline and 50 percent faster diagnosis and repair. It may be that such dramatic goals can be achieved largely, perhaps fully, through improvement of today's processes.

Finally, dramatic performance improvements in key processes also buffer the RML against problems that may arise in acquiring more supportable weapon systems. If these systems are delayed or cancelled, fail to perform as promised, or cannot be employed for political or other reasons, then process improvement at least ensures that the Army still will have achieved much of the RML.

A key question for achieving the RML, then, is whether truly dramatic improvement in the performance of key logistics processes is feasible in the near term. Many have argued that dramatic improvement is not possible; in fact, three distinct groups take this position, though for different reasons. One group believes the current processes are performing about as well as one can expect and that there simply is no room for dramatic improvement (there is more than a hint of this position in Fontaine's assertion). A second group acknowledges that dramatic improvement may be possible, but believes that it can occur only through a major infusion of resources, such as more money and more people, which will not be forthcoming in the foreseeable future. Those in the third group believe that, while dramatic improvement may be technically feasible, deep-rooted organizational and cultural barriers to change inevitably prevent the Army from achieving it.

All of these beliefs once may have been true. Yet there is good evidence that dramatic improvement in the performance of the Army's key logistics processes is possible, affordable, and achievable. For instance, over the past 3 years, the Army has succeeded in achieving more than a 50-percent reduction in order and ship time (OST) for units in the continental United States (CONUS) ordering from wholesale supply sources. Improvement of this magnitude signals a revolution not only in performance but also in the demonstrated capability of the Army logistics community to implement fundamental reform.

Improvements in Logistics Processes

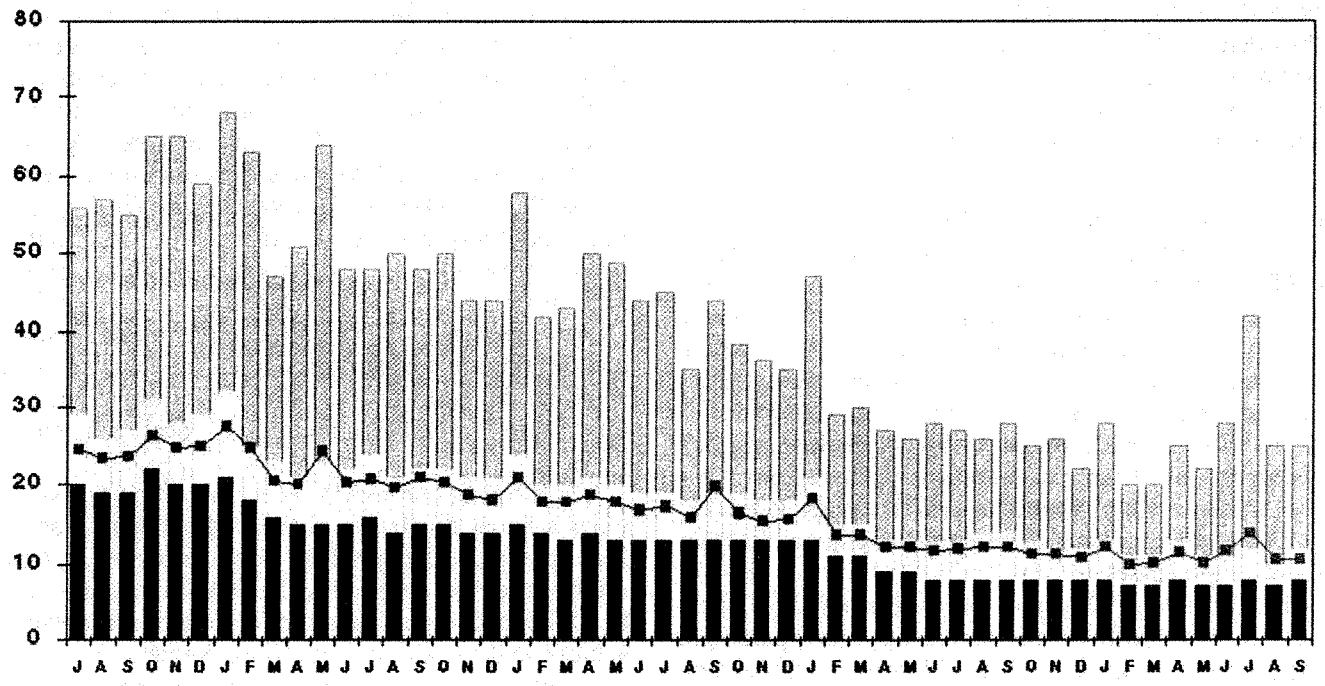
VM is an Army initiative to improve dramatically the performance of today's key logistics processes. It adapts to the military many of the technological and

managerial innovations that have proved successful in the commercial sector. By dramatically improving the speed and accuracy of all logistics processes, VM also seeks to reduce the need for massive logistics resources. The VM initiative was kicked off in January 1995 by the Army's Logistics Triad. Members of the Triad are the Deputy Chief of Staff for Logistics, the Deputy Commander of the Army Materiel Command, and the Commanding General of the Army Combined Arms Support Command (CASCOM), who serves as the executive agent for implementation.

The first focus of the VM initiative was to achieve dramatic improvement in the process used by Army personnel to order and receive supplies. The order and ship process was the logical starting point for major reform for two reasons. First, its criticality to the successful operation of the logistics system was widely understood; in fact, logistics sometimes has been defined simply as "getting the right stuff to the right place at the right time." Second, it also was recognized that improvement was needed. For decades, through peace and war, the order and ship process has been plagued by a catalog of stubborn performance problems. Each segment, from requisitioning an item to receiving the package, not only was slow but also was unreliable. OST's for orders varied widely. Some orders were delivered in a few days, but others took weeks, even when the ordered items were in stock. Moreover, a lack of confidence in the reliability of the order and ship process led some Army personnel to hoard supplies and place duplicate orders.

The figure below shows how dramatically the order and ship process has improved in speed and reliability under VM. The bars on the figure represent the monthly OST performance for orders for repair parts that were placed by active units in CONUS and filled by the wholesale supply system. Because this effort focused on improving the order and ship process for items on the shelf, backorders are excluded from the data. (The backorder problem is the result of a different logistics process and is being addressed separately.) The vertical dashed line distinguishes two periods of performance. The period from July 1995 through July 1998 represents performance trends since the VM initiative took hold. The 12 preceding months, July 1994 to June 1995, are the baseline period and serve as the basis of comparison for gauging progress. The segments on each bar measure each month's OST performance at the 50th, 75th, and 95th percentiles. For example, the 50th percentile indicates the day by which 50 percent of the orders are filled, the 75th indicates 75 percent, and so on. The line running through all bars is the average OST.

As the figure shows with the continuing downward slope of the bars and line, the Army has made dramatic and nearly continuous improvements in the order and ship process under VM. The performance during the baseline period was 17, 25, and 56 days for the 50th, 75th, and 95th percentiles respectively, with an average OST of just over 22 days. Corresponding figures for September 1998 were 8, 12, and 25 days, with an aver-



☐ Order and ship times in CONUS have fallen about 50 percent under the Army's VM initiative.

age OST of 10.6 days—in short, more than a 50-percent reduction at all percentiles.

Compared to CONUS units overall, some of the large Army Forces Command installations that were among the first to participate in the VM initiative have achieved even greater gains, suggesting that other units also can expect to achieve further reductions. For instance, for active units at Fort Bragg, North Carolina, the median OST has declined from a baseline average of 18 days to 6 days in September 1998—a 67-percent reduction. The 75th and 95th percentiles show similar improvement. Average OST has fallen from 26.3 days for the baseline period to 8 for September 1998.

Efforts under VM to improve the speed and reliability of the order and ship process initially focused on CONUS OST, but they quickly were extended to units outside of CONUS (OCONUS) with similar success. For instance, mean OST for U.S. Army, Europe, units receiving parts by air shipment (by far the predominant mode) from CONUS depots declined from 23 days during the baseline period to 16.5 days in September 1998, a 29-percent improvement. Similarly, mean OST to Korea over the same timeframe decreased from 26.3 days to 13.1 days, a 50-percent improvement. Gains in other theaters have been comparable. That these reductions are far less, proportionately, than those achieved by CONUS units reflects both the additional complexities of the OCONUS distribution system and the fact that VM generally was implemented later by overseas installations.

In June 1998, on behalf of all Army logisticians participating in the VM initiative, CASCOM received Vice President Al Gore's Golden Hammer award from the National Partnership for Reinventing Government. The award was given in recognition of the Army's dramatic and continuing progress in reducing OST.

Revolution in Capability to Improve

As was the case with the Army's slow and variable OST before VM, many performance deficits in Army logistics processes are longstanding. In most cases, the Army has long recognized these chronic problems, but repeated efforts to identify and eliminate their sources proved ineffective. So it is worth considering how, under the VM initiative, the Army finally made such quick and impressive headway in improving the effectiveness and efficiency of one process as well as how it has begun to extend the same improvement approach to other logistics processes.

Proponents of VM claim that VM is based on a new way of doing business and represents a new paradigm for managing logistics. The VM concept has several components—

- ***A process perspective.*** Under VM, the logistics system is considered to be a set of processes that deliver products and services to customers. Typically these processes cut across organizations. Many key activities are performed by non-Army and even nongovernment organizations. In addition to the order and ship process, key logistics processes targeted for improvement by the VM initiative are repair, stockage determination, and financial management.
- ***An improvement focus.*** Management of logistics processes is focused primarily on improving their performance. Improvement is sought in three dimensions: time, quality, and cost. That is, VM seeks to make logistics processes "faster, better, and cheaper."
- ***A process improvement methodology.*** The performance of processes is improved by applying a three-step method called D-M-I: Define the process, Measure the process, Improve the process. This cycle is repeated continuously.
- ***An emphasis on performance measurement.*** Measurement is the central activity to foster improvement because it helps to identify performance deficits, monitor the effects of interventions to improve performance, and provide motivation and feedback to implementers.
- ***Use of cross-functional teams to increase the capability to improve.*** Because processes cut across organizational boundaries, and because each segment may be technically complex, no single organization or individual has sufficient knowledge or power to make dramatic changes. Coalitions of leaders are needed to guide and sustain an effective large-scale effort. In the case of VM, the Triad forms the nucleus of a board of directors (VM BOD), sometimes referred to as the Velocity Group. Teams of experts are needed to identify and implement needed improvements through application of the D-M-I method. VM is implemented by cross-functional teams of two types: process improvement teams (PIT's) and site improvement teams (SIT's). Each PIT is an Army-wide team composed of functional experts representing all segments of a particular process as well as Army and RAND Arroyo Center analysts. (Note: The Arroyo Center is a federally funded research and development center for studies and analyses sponsored by the Army.) Each Army installation has been directed to form a SIT composed of local technical experts.

The effort to improve the order and ship process provides a good illustration of the VM concept in action. In particular, it demonstrates how the cross-functional improvement teams employ the D-M-I method to build the collective expertise and coordination necessary to achieve and sustain dramatic improvement.

"Define," the first step, aims at producing a clear picture of the entire process that the team is attempting to improve. Improving the order and ship process required

the participation of experts from many organizations, both within and outside the Army. These experts literally walk the process from the time the need for a part is identified until the part arrives in the hands of the mechanic who is going to install it on the equipment. Such a detailed definition phase is critical because, though many personnel are expert in their own segment of the process, no one has a detailed understanding of every stage. Various functions are involved in the order and ship process—transportation, maintenance, supply—and improving the process requires the involvement of all functional players.

Once the process was defined, it was necessary to determine the best way to measure it to foster improvement. Although VM seeks improvements in time, quality, and cost, as its name suggests, it focuses first on reducing the cycle time of key processes. Often as this time is reduced, quality improves and costs decline. OST was defined as the time between placing an order and receiving the item. Under the Standard Army Retail Supply System-Objective (SARSS-O), it is the time from the supply support activity and back. Because both the speed and the reliability of OST needed dramatic improvement, metrics were developed and approved by the VM BOD that indicated median performance as well as performance at the 75th and 95th percentiles. The percentiles gave information on typical OST performance and focused efforts on reducing the wide variations in delivery time associated with the orders that take the longest time to be filled and delivered. By contrast, the traditional Army metric, average or mean OST, masked the underlying variability of the process and did not accurately represent its typical performance.

The order and ship PIT used the data associated with the metrics to help diagnose systemic problems. Statistical analysis and data mining were used to identify sources of delay. Another tool used successfully by the SIT's was a report that listed each requisition with an OST beyond the 95th percentile. These "outliers" were researched individually by personnel operating in each segment of the process to identify and eliminate the sources of such extraordinary delay.

The definition and measurement stages showed that many segments of the process were being managed with metrics that did not necessarily result in good customer service. For example, in some segments of the process, organizations measured themselves by the efficient use of trucks, so partial truck loads were held up until a full one could be assembled. While this goal and this metric yielded more efficient use of trucks, it delayed getting the needed part to the customer and lengthened OST for many orders. There have been other examples of conflicting goals that resulted in the apparent efficient use of some resources at the overall expense of the whole.

The final stage of D-M-I, "improve," involves combining the end-to-end understanding of the process developed in the "define" stage with the diagnoses of the sources of performance deficits that were isolated in the "measure" stage. Once likely process improvements were identified, the Army implemented the changes that it could do on its own. At the local level, these changes ranged from minor fixes, such as improving the work flow at a specific supply support activity, to abandoning an established way of doing business, such as shifting to a new shipping mode. At the macro level, their cumulative impact on process performance proved dramatic.

Army installations strengthened oversight, simplified rules, increased the use of new requisitioning and receiving technologies, reduced review processes, streamlined on-post delivery, and made use of the information available from the new metrics. These changes enabled installation SIT's to achieve consistent performance standards of 1 day for order entry and 1 day for order take-up and receipt. Other changes required establishing partnerships with the organizations that controlled other segments of the order and ship process, such as the Defense Logistics Agency (DLA), which operates the depots, and commercial trucking and small package delivery firms. DLA improved work flows through its distribution depots, sped up the processing of materiel release orders, packaged and directed shipments to reduce intermediate handling on post, and worked with commercial shippers to provide scheduled deliveries.

The analyses of order and ship process performance that the RAND Arroyo Center conducted in support of the Army's VM initiatives included diagnoses of two process segments that were not under the Army's direct control: the processing of orders in the depot and the movement of items from the depot to the installations. These analyses showed that much of the delay and variable shipping times in these segments reflected the use of a variety of shipping modes in an attempt to match each order with the lowest cost shipping mode that was appropriate to its urgency and characteristics such as size and weight. The mixing of modes caused some orders to be delayed (for instance, to wait until enough similar orders accumulated to fill a truck) and required the installations receiving the materiel to cope with multiple deliveries, most of them unscheduled.

The analyses suggested strongly that the delays and variability in the depot and transit segments could be reduced greatly if the Army and DLA could establish scheduled trucks (similar to regular mail deliveries) as the primary shipping mode to Army installations. Other activities, such as depot processing, then could be synchronized with these regular delivery schedules. Most depot-post combinations had driving times of 2 days or less and sufficient volume to support trucks daily or

every other day. In such cases, even high-priority items that formerly were shipped by air could be placed on these trucks, saving the expense of using premium transportation services such as FedEx.

Working closely with the Army, DLA increased the use of scheduled truck shipments for large installations. Under the scheduled truck concept, depots that serve large installations place all the shipments for that installation, regardless of eligibility for air shipment or bulk considerations, on a routinely scheduled truck. To increase the opportunities for capitalizing on scheduled trucks, DLA implemented a number of changes. Its depots applied automation to sort shipments into multipacks and added automated manifest cards for key customers on post, reducing work loads and decreasing the time required to receipt shipments. The stock positions at some depots changed to reflect the needs of the closest Army installations. This permitted more volume to flow between these depot-installation combinations at no additional transportation cost; in some cases, it increased the number of trucks that could be sent cost-effectively per week. More frequent deliveries mean lower OST.

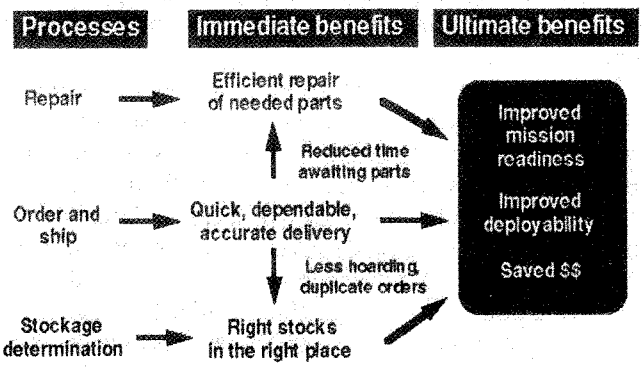
Although this discussion of the VM implementation has focused on actions taken to improve CONUS OST in peacetime, many of these actions also helped improve OST for OCONUS units, including those in deployed operations. This was a natural consequence because most of the CONUS segments of the order and ship process are also part of the OCONUS process. The streamlining of ordering, depot processing, and receiving activities contributes to the reduction of both CONUS and OCONUS OST, as does the improved positioning and sourcing of stocks to accommodate the needs of major customers of the depots Moreover, the same process changes that make peacetime performance faster and more reliable also contribute to fast, agile, and robust wartime performance.

The RML is Underway

The Chief of Staff was right about the dependence of the RMA on an RML. Current thinking about future Army operations routinely postulates a future logistics system that is so much "faster, better, and cheaper" than today's that the Army will require a revolution to achieve the anticipated performance levels. Fortunately, the success of the VM initiative demonstrates that the revolution is well underway.

The VM initiative is not limited to improving the order and ship process or to reducing cycle times. From dramatically improved OST, the revolution in performance can spread quickly and systematically. As the figure above indicates, an improved order and ship process has many benefits, both direct and indirect. Most directly, improved OST means the quick and dependable delivery of spare parts and other supplies throughout the Army.

In addition to giving customers what they need when they need it, a quick and reliable order and ship process also reduces the number of orders in the system because Army personnel are no longer so frustrated that they reorder a delayed part several times. They also have less incentive to hoard parts because they are more confident they will get them when they order them.



☐ Improvements in one logistics process contribute to improvements in related processes.

Improved OST also improves the Army's repair and stockage determination processes. The repair process experiences fewer and shorter delays due to delayed parts supply. Faster delivery means local stocks do not have to be as deep. Some of the money saved from having shallower stocks of a given item can be reinvested in providing a broader array of parts. Thus, more of the necessary parts are available locally, further speeding repairs.

The VM BOD has directed other improvement teams to apply the D-M-I method to the repair process and the stockage determination process as well as to the financial management process. Moreover, for each of these processes, the goal of the PIT's is to identify and eliminate sources not only of delays but also of errors and waste. Focusing on time, quality, and cost will deliver a logistics system that is faster, better, and cheaper.

Dramatic process improvement under the VM initiative is a key enabler of the Revolution in Military Logistics. **ALOG**

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